Patent Claims

1. An optical retardation film comprising two layers of an anisotropic polymer that are adjacent to each other or adjacent to both sides of a common substrate, characterized in that each layer exhibits a tilted structure with an optical symmetry axis having a tilt angle θ relative to the plane of the layer.

2. An optical retardation film according to claim 1 that exhibits a tilted and splayed structure, wherein the tilt angle θ in each of said layers varies continuously in a direction normal to the layer, starting from a minimum value θ_{min} at the side of the layer facing the other layer or, if present, the common substrate, and ranging to a maximum value θ_{max} on the opposite side of the layer, or vice versa.

3. An optical retardation film according to claim 2, wherein said minimum tilt angle θ_m in each layer is substantially zero degrees.

4. An optical retardation film according to claim 1, 2 or 3, wherein the projection of the optical symmetry axis of the first layer into the plane of the layer and the projection of the optical symmetry axis of the second layer into the plane of the layer are twisted relative to each other at an angle ρ in the plane of the interface between the layers, said angle ρ being preferably from 0 to 90 degrees.

5. An optical retardation film according to claim 4, wherein said angle ρ is substantially 0 degrees.

6. An optical retardation film according to any of the claims 1 to 5, characterized in that the retardation of the optical retardation film is from 50 to 250 nm.

7. An optical retardation film according to any of the claims 1 to 6 that is obtainable by a method comprising the following steps

A) coating a mixture comprising

a) a polymerizable mesogenic material comprising at least one polymerizable mesogen having at least one polymerizable functional group,

b) an initiator, and

c) optionally a solvent

on a substrate or between a first and a second substrate in form of a layer,

B) aligning the polymerizable mesogenic material in the coated layer into a tilted and optionally a splayed structure.

C) polymerizing said mixture of a polymerizable mesogenic material by exposure to heat or actinic radiation,

D) optionally removing the substrate or, if two substrates are present, one or two of the substrates from the polymerized material, and

E) repeating the steps A), B), C) and optionally step D) at least one more time.

8. An optical retardation film obtainable according to claim 7, characterized in that the steps A), B) and C) are carried out on both sides of a common substrate.

9. An optical retardation film obtainable according to claim 7 or 8, characterized in that the mixture of the polymerizable mesogenic material comprises at least one polymerizable mesogen having one polymerizable functional group and at least one

polymerizable mesogen having two or more polymerizable functional groups.

10. An optical retardation film according to any of the claims 7 to 9, characterized in that the polymerizable mesogens are compounds of formula I

$$P\text{-}(Sp\text{-}X)_n\text{-}MG\text{-}R \qquad I$$

wherein

P is a polymerizable group,

Sp is a spacer group having 1 to 20 C atoms,

X is a group selected from -O-, -S-, -CO-, -COO-, -OCO-, -OCOO- or a single bond,

n is 0 or 1,

MG is a mesogenic or mesogenity supporting group, preferably selected according to formula II

$$-(A^1\text{-}Z^1)_m\text{-}A^2\text{-}Z^2\text{-}A^3\text{-} \qquad II$$

wherein

A^1, A^2 and A^3 are independently from each other 1,4-phenylene in which, in addition, one or more CH groups may be replaced by N, 1,4-cyclohexylene in which, in addition, one or two non-adjacent CH_2 groups may be replaced by O and/or S, 1,4-cyclohexenylene or naphthalene-2,6-diyl, it being possible for all these groups to be unsubstituted, mono- or polysubstituted with halogen, cyano or nitro groups or alkyl, alkoxy or alkanoyl groups having 1 to

7 C atoms wherein one or more H atoms may be substituted by F or Cl,

Z^1 and Z^2 are each independently -COO-, -OCO-, $-CH_2CH_2-$, $-OCH_2-$, $-CH_2O-$, -CH=CH-, -C≡C-, -CH=CH-COO-, -OCO-CH=CH- or a single bond,

m is 0, 1 or 2, and

R is an alkyl radical with up to 25 C atoms which may be unsubstituted, mono- or polysubstituted by halogen or CN, it being also possible for one or more non-adjacent CH_2 groups to be replaced, in each case independently from one another, by -O-, -S-, -NH-, $-N(CH_3)-$, -CO-, -COO-, -OCO-, -OCO-O-, -S-CO-, -CO-S- or -C≡C- in such a manner that oxygen atoms are not linked directly to one another, or alternatively R is halogen, cyano or has independently one of the meanings given for $P-(Sp-X)_n-$.

11. A means to produce substantially linear polarized light, comprising a broadband circular reflective polarizer and an optical retardation film according to any of the claims 1 to 10.

12. A liquid crystal display comprising a display cell and an optical retardation film according to any of the claims 1 to 10.

13. A liquid crystal display comprising a display cell and a means to produce substantially linear polarized light according to claim 11.

DESCRIPTION